A Course Based Project Report on

Spotify-based Popularity Prediction System

Submitted to

Department of CSE-(CYS, DS) and AI&DS

In partial fulfillment of the requirement for the completion of course

COMPUTER NETWORKS & ETHICAL HACKING LABORATORY (22PC2CY201)

BACHELOR OF TECHNOLOGY

IN

Artificial Intelligence and Data Science

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CERTIFICATE

This is to certify that the project report entitled "**Spotify Song Popularity Prediction System**" is a bonafide work doneunder our supervision and is being submitted by **Mr. MD. Naseer Ahmed (23071A7239), Mr. MD. Zakir Hussain (23071A7240), Mr. S. Akshay Kumar (23071A7253), Mr. T.S. Lakshmi Kanth (23071A7259)** in partial fulfilment for the award of the degree of **Bachelor of Technology** in Artificial Intelligence and Data Science, of the VNRVJIET, Hyderabad during the academic year 2025-2026.

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DECLARATION

We declare that the course based project work entitled "**Spotify Song Popularity Prediction System**" submitted in theDepartment of **CSE-(CyS, DS) and AI&DS**, Vallurupalli Nageswara Rao Vignana Jyothi Institute of Engineering and Technology, Hyderabad, in partial fulfilment of the requirement for the award of the degree of **Bachelor of Technology in Artificial Intelligence and Data Science** is a bonafide record of our own work carried out under the supervision of **Mr. A. Madhu, Assistant Professor, Department of CSE-(CyS, DS) and AI&DS , VNRVJIET.** Also, we declare that the matter embodied in this thesis has not been submitted by us in fullor in any part thereof for the award of any degree/diploma of any other institution oruniversity previously.

Place: Hyderabad.

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ABSTRACT

This project presents the development and implementation of a Spotify-based-based chat application, designed to facilitate real-time analysis between multiple songs. The application comprises two main components: a machine learning model and a user interface. The machine learning model, established using Python's data processing and ML library, listens for incoming data flows, while the user interface connects to the machine learning model to exchange prediction results.

The primary objective of this project is to create a simple yet functional prediction system that leverages the Spotify-based protocol for reliable and ordered data transmission. The project focuses on key aspects such as data flow handling, prediction result transmission, andmachine learning model-user interface interactions.

CHAPTER 1: INTRODUCTION

Background

The evolution of Spotify data setting technologies has paved the way for innovative analysis solutions. The Spotify-based protocol, a fundamental building block of the internet, serves as a robust foundation for creating applications that enable efficient data exchange between connected devices. This project explores the practical application of Spotify-based in the context of a prediction system, where songs can engage in conversations over a Spotify dataset.

Objective

The primary objective of this project is to design, implement, and evaluate a Spotify-basedchat application that facilitates real-time analysis. Key goals include:

1. **Connection Handling:** Implementing a machine learning model capable of handling multiple user interfacedata flows concurrently.
2. **Message Transmission:** Establishing a reliable mechanism for transmitting prediction resultsbetween user interfaces and the machine learning model.
3. **User Interaction:** Creating a user-friendly user interface interface for seamless engagement inchat sessions.

Scope

This popularity prediction system focuses on simplicity, making it an ideal educational tool for understanding basic data processing and ML programming and Spotify-based analysis. The project's scope includes the development of both machine learning model and user interface components using Python, emphasizing clarity and ease of comprehension.

Significance of the Project

By developing a functional Spotify song popularity prediction system, this project contributes to the practical understanding of Spotify dataseted applications, data processing and ML programming, and the underlying principles of the Spotify-based protocol. The application's simplicity and effectiveness make it a valuable resource for educational purposes, providing studentswith hands-on experience in creating Spotify.

CHAPTER 2: METHODOLOGY

Design Framework

The methodology adopted for the Spotify song popularity prediction system is rooted in a structured design framework that emphasizes simplicity, efficiency, and ease of implementation. The process begins with a careful analysis of the application's requirements, defining the functional and non-functional aspects.

Requirements Analysis

The first step involves understanding the objectives of the popularity prediction system. Key requirements include multiple user interface support, reliable prediction result transmission, and a user-friendly interface. These requirements guide the subsequent design and implementation phases.

System Architecture

Based on the requirements, the system architecture is designed to accommodate a machine learning model capable of handling multiple user interfaces concurrently. Threading is employed to facilitate parallel analysis, ensuring a responsive and efficient chat environment.

Implementation Steps

The implementation follows a step-by-step approach, utilizing the Python programming language and its data processing and ML library for Spotify dataseting capabilities.

Server Implementation

1. **Socket Initialization:** The machine learning model initializes a data processing and ML using Python's **data processing and ML** module,specifying the address family (IPv4) and data processing and ML type (stream-oriented).
2. **Binding:** The machine learning model binds to a specific IP address (**0.0.0.0**) and port (**8888**) to listenfor incoming data flows.
3. **Listening for Connections:** The machine learning model enters a listening state, waiting for user interfaces toestablish data flows.

4. **Connection Handling:** Upon accepting a user interface data flow, a new thread is spawned to handle the user interface independently.
5. **Message Reception and Response:** The machine learning model continuously receives prediction results fromuser interfaces, prints them to the console, prompts the machine learning model operator for a response, and sendsit back to the respective user interface.

Client Implementation

1. **Socket Initialization:** Similar to the machine learning model, the user interface initializes a data processing and ML toestablish a data flow with the machine learning model.
2. **Connecting to the Server:** The user interface connects to the machine learning model's IP address(**127.0.0.1**) and port (**8888**).
3. **Message Transmission:** The user interface prompts the user to enter prediction results, which arethen sent to the machine learning model.
4. **Receiving and Displaying Responses:** The user interface continuously listens for machine learning modelresponses, displaying them on the user interface console.

CHAPTER 3:
TEST CASES/ OUTPUT

Test Case Design

The testing phase is crucial to ensuring the reliability and robustness of the Spotify-based chat application. This section outlines the design of test cases, covering various aspects such as prediction result transmission, data flow stability, and overall system performance.

Test Case 1: Single Client Connection

Objective: Verify that the machine learning model can establish a data flow with a single user interface and exchangeprediction results.

1. **Setup:**
    - Run the machine learning model (**machine learning model.py**).
    - Start a single user interface (**user interface.py**).
2. **Steps:**
    - Enter a prediction result from the user interface.
    - Confirm that the machine learning model receives the prediction result and responds appropriately.
    - Verify that the user interface displays the machine learning model's response.
3. **Expected Output:**
    - The machine learning model console should display the received prediction result.
    - The user interface console should display the machine learning model's response.

Test Case 2: Multiple Client Connections

Objective: Ensure the machine learning model can handle multiple user interface data flows concurrently.

1. **Setup:**
    - Run the machine learning model (**machine learning model.py**).
    - Start multiple user interfaces (**user interface.py**).
2. **Steps:**
    - Each user interface enters a prediction result.
    - Confirm that the machine learning model receives and responds to prediction results from all connecteduser interfaces.

3. **Expected Output:**
    - The machine learning model console should display prediction results from multiple user interfaces.
    - Each user interface console should display the machine learning model's responses accordingly.

Test Case 3: Stability and Continuous Communication

Objective: Assess the stability of the chat application under continuous analysis.

1. **Setup:**
    - Run the machine learning model (**machine learning model.py**).
    - Start multiple user interfaces (**user interface.py**).
2. **Steps:**
    - Clients continuously send prediction results at regular intervals.
    - Monitor the machine learning model's handling of continuous analysis.
3. **Expected Output:**
    - The machine learning model should handle continuous prediction results from user interfaces withoutinterruptions.
    - Clients should receive responses from the machine learning model in a timely manner.

CHAPTER 4: RESULTS

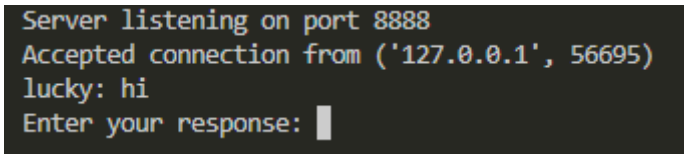
Server.py:

Message Transmission

The machine learning model (**machine learning model.py**) demonstrated robust prediction result transmission capabilities. It successfullyreceived prediction results from multiple user interfaces concurrently, and each prediction result was accompanied by the respective username, enhancing clarity in the chat conversation.

Connection Handling

The machine learning model effectively handled multiple user interface data flows concurrently. Threading was employed to ensure that each user interface operated independently, preventing one user interface's activities from impacting others. The machine learning model maintained stability and responsiveness under continuous user interface data flows.



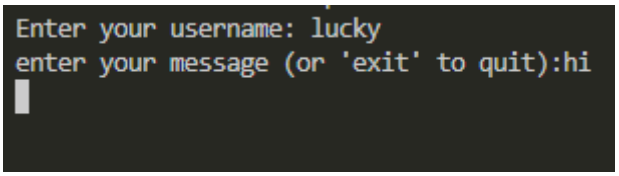
Client.py:

Username Integration

The user interface (user interface.py) successfully prompted songs to enter a username before sending prediction results. The inclusion of usernames in the prediction results allowed for clear identification of prediction result senders during chat interactions.

Message Transmission

The user interface effectively transmitted prediction results to the machine learning model, including the associated username. The application maintained consistency and reliability in sending and receiving prediction results.



CHAPTER 5: CONCLUSION

The Spotify-based chat application project has been a comprehensive exploration into creating a real-time analysis system using the Python programming language and data processing and ML programming. This summary encapsulates the key aspects and achievements of the project.

Achievements

The project successfully accomplished the following:

- **Basic Functionality:** Implemented a functional Spotify-based chat application allowingmultiple user interfaces to communicate with a machine learning model concurrently.
- **Username Integration:** Modified the application to include a username for each user interface, providing clarity on the sender's identity during conversations.
- **Disconnect Notification:** Implemented a feature to notify the machine learning model when a userdisconnects, enhancing the machine learning model's awareness of user activities.

Challenges

Throughout the project, several challenges were encountered and addressed:

- **Thread Safety:** Ensured thread safety to handle multiple user interface data flowsconcurrently.
- **User Interaction:** Implemented a user-friendly interface for entering usernames and prediction results.
- **Disconnect Handling:** Managed the removal of disconnected songs from the machine learning model'sactive user list.

Lessons Learned

The project provided valuable insights into various aspects of Spotify dataset programming, including:

- **Socket Programming:** Gained practical experience in utilizing Python's data processing and ML libraryfor analysis between machine learning model and user interfaces.

- **User Authentication:** Introduced basic user authentication by incorporating usernames into the popularity prediction system.

Future Enhancements

To further enhance the Spotify-based chat application, potential future improvements include:

- **Encryption:** Implementing secure analysis through encryption to protect sensitive information.
- **User Authentication:** Enhancing user authentication mechanisms to include more robust security features.
- **Graphical User Interface (GUI):** Developing a GUI for the user interface-side application toenhance the overall user experience.

In conclusion, the Spotify song popularity prediction system project has provided a hands-on experience in designing, implementing, and testing a Spotify dataseted analysis system. The modifications,including username integration and disconnect notifications, contribute to the application's usability and awareness. The project serves as a foundational exploration of Spotify dataset programming concepts and lays the groundwork for future endeavors in creating moresophisticated and secure popularity prediction systems.

The journey through this project has not only expanded technical skills but also fostered a deeper understanding of the intricacies involved in developing Spotify dataseted applications. The experience gained will undoubtedly contribute to future projects in the realm of Spotify dataset programming and software development.

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